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PIONEER POLAR STRUCTURES — ACCESSORIES FOR THE JAMESWAY SHELTER

Y-F015-11-146

Type C Final Report

by

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ABSTRACT

Accessories were developed for improving the Jamesway in order to provide a suitable lightweight, quick-erecting shelter for use as quarters, messing, galley, utilities, administration, and other such applications in pioneer polar camps. These accessories included a heavy-duty floor and foundation system, a wall-extension kit, special entry kits, an improved electrical distribution system, and special utility accessories.

Prototypes of the accessories were fabricated and evaluated by the Laboratory. Evaluation indicated that they met the requirements of pioneer polar operations and increased the general usefulness of the Jamesway shelter.

It was concluded that the heavy-duty floor and foundation system, the wall-extension kit, the special entries, and the improved electrical distribution system should be accepted as standard accessories for the Jamesway shelter. The special utility accessories should be considered for use with the Jamesway for special applications.

Drawings and specifications for the accessories described in the report are presented in Technical Note N-452.

Qualified requesters may obtain copies of this report from ASTIA.  
The Laboratory invites comment on this report, particularly on the  
results obtained by those who have applied the information.

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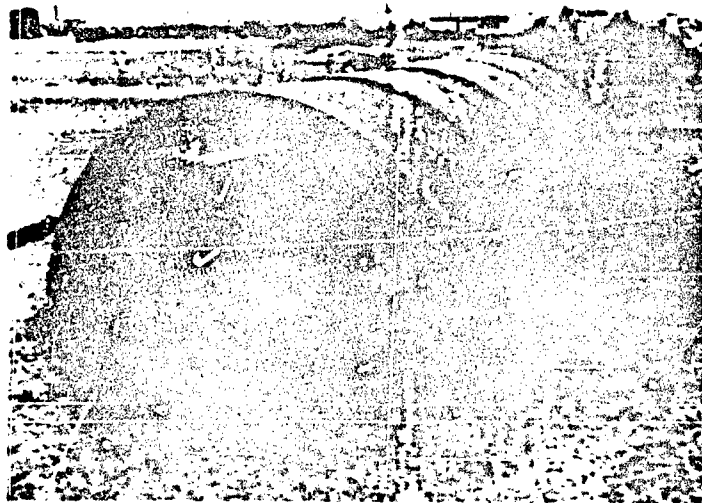


Figure 1. Basic Jamesway with vestibule.

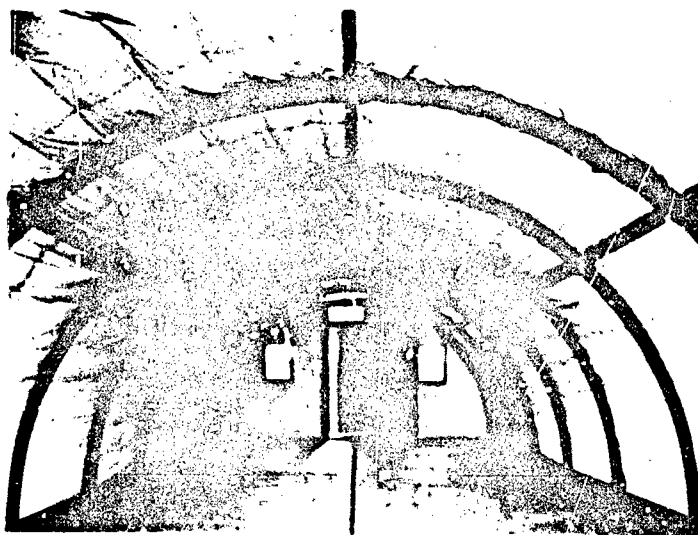


Figure 2. Interior of Jamesway.

## PART I. INTRODUCTION

### PIONEER POLAR SHELTER REQUIREMENTS

Experience has shown that man requires warm clothes, good food, and comfortable shelter for efficient and effective performance in a polar environment. The need for comfortable shelter is especially critical when individuals pioneering these regions are not motivated by exploration and high adventure. Under these conditions, warm moderately comfortable quarters for rest and relaxation can make the difference between a productive work force with high morale and an ineffective force with low morale.

In addition to the requirement of comfort, a shelter for polar operations up to one year in duration must be lightweight, easily erected, and readily available in the military supply system. Since this shelter is being considered for all pioneer polar operations, it must also be adaptable to various geographical locations and usages. It may be used for quarters, messing, galley, utilities, administration, medical care, or other shelter needs.

Several years of use in the Arctic and Antarctic have proven the Army Quartermaster Corps Tent, frame-type, insulated, commonly known as the Jamesway, to be a comfortable and adaptable nonrigid shelter for pioneer polar operations. Based on the fulfillment of the above requirements, the Jamesway was selected as the basic building to be used for development of a suitable shelter for pioneer (short-life) polar camps.

### DESCRIPTION OF BASIC JAMESWAY

The Jamesway consists of an insulated, sectional, plywood floor over which wooden arches are erected and covered with 1-inch fiberglass-insulated blankets of vinyl-coated cotton. The floor units, when locked together in pairs, also serve as packing cases for the building. The basic unit (Figure 1) is 16 feet by 16 feet by 8 feet high. This unit can be expanded to any length by the addition of 4-foot intermediate sections. The most common building lengths are 32 feet and 48 feet.

The Jamesway is entered through doors located at the center of each endwall (Figure 2). There is a window on each side of the doors and an opening above each door for a vent pipe. The arch roof provides 8 feet of headroom at the center of the

building, but drops off at the sides making the floor space at the edges of the building unusable. A vestibule may be attached to each end of the building to protect the entry.

The Jamesway is detailed in Army Quartermaster Corps Drawings No. 5-4-181 through 5-4-188. Procurement data is available in Military Specification MIL-T-10168E.

#### LIMITATIONS OF BASIC JAMESWAY

The Jamesway basically fulfills shelter requirements for pioneer polar operations;<sup>1-4</sup> however, continual usage of the structure has revealed certain limitations:

1. The building does not have an adequate floor and foundation system for supporting heavy loads.
2. The low profile of the arch ribs (Figure 2) does not provide sufficient headroom along the sides of the building for optimum space utilization.
3. The doors, placed at the center of the endwalls, limit the flexibility of interior arrangement and the camp layout.
4. The vestibules, which require a 90-degree turn before entering the building, limit the size of admitted items after the building is erected.
5. The electrical system is inadequate.
6. The basic building does not include any utility accessories, such as a toilet and a water-supply system.
7. Vents are often required at points other than at the ends of the building.

This report covers the development of accessories for the Jamesway to remedy these limitations, as follows:

1. Heavy-duty floor
2. Special foundation system
3. Wall-extension kit
4. Special entries

5. Improved electrical distribution system
6. Water-storage tanks
7. Snow melter
8. Dry head kit
9. Special roof vent

#### GENERAL CRITERIA FOR JAMESWAY ACCESSORIES

In consideration of the above limitations and based on experience in pioneer polar operations, some general criteria were established for designing accessories to improve the Jamesway, as follows:

1. Satisfactory operation in ambient temperatures to -65 F.
2. Air shipment by C-130 aircraft.
3. Simplicity of design.
4. Simplicity of fabrication.\*
5. Minimum maintenance requirements.
6. Maximum use of Navy standard stock items or readily available commercial items.
7. Fast and efficient erection or assembly.
8. Minimum of alterations to basic building.
9. Application to buildings 16, 32, and 48 feet and longer as appropriate.

\* All units described in this report except the water-storage tank were fabricated with equipment commonly available in small shops.

## PART II. HEAVY-DUTY FLOOR

The standard Jamesway floor units of plywood construction are not adequate for transmitting large concentrated loads to the foundation. Even though failure may not occur, large deflections result in excessive canting of the floor surface.<sup>1</sup> This canting often occurs in floor units supporting galley appliances, diesel generators, and other heavy equipment.

### CRITERIA

The floor units had to be sufficiently strengthened to support heavy equipment without critical deflection. In addition to meeting requirements of the general criteria, deflection was limited to 1/2 inch under a concentrated loading of 1,000 pounds.

### DESIGN

Design studies were conducted by reinforcing floor units with wood strengthening members placed under the floor at approximately 1-foot spacing. Strengthening members made of 2 x 6 timbers were inserted in two standard floor panels. In one panel the members spanned the width of the panel and in the other they spanned the length. Concentrated loads were applied at the center of the reinforced panels, which were supported at the ends. Deflections were measured at the center of each panel. Transverse reinforcement was more effective in reducing deflections than longitudinal reinforcement. As shown in Figure 3, the deflection under a 1,000-pound load on the panel with transverse reinforcement was only 0.25 inch as compared to 0.56 inch for the panel with longitudinal reinforcement. Both methods of reinforcement were superior to a standard panel without reinforcement which deflected 0.50 inch under a 275-pound load.

As a result of these tests, a floor-strengthening kit with transverse members was designed for the standard Jamesway floor panel (Figure 4). The strengthened unit was designated as a heavy-duty floor panel.

### DESCRIPTION

The floor-strengthening kit for the heavy-duty floor panel, in its final design, is detailed in Y&D Drawing No. 936916 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Laboratory Technical Note N-482.<sup>5</sup>

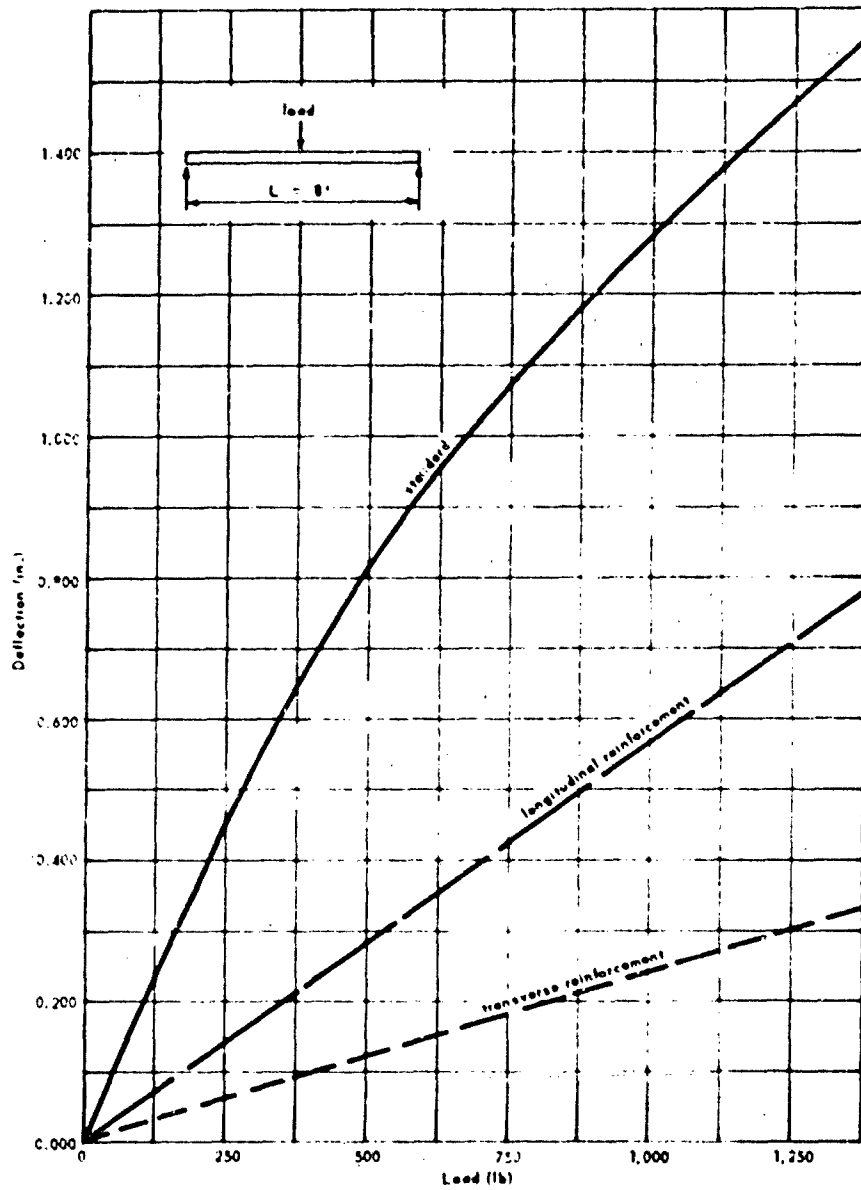


Figure 3. Deflection of standard and reinforced floor panel under concentrated load at center.

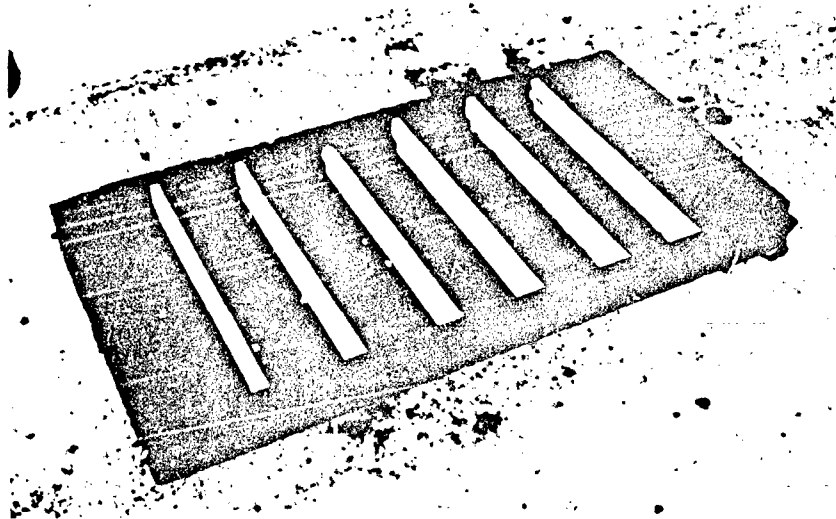


Figure 4. Reinforced floor unit.

The strengthening kit consists of six 2 x 6's 3 feet 9-3/4 inches long, notched 3/4 inch by 1-3/8 inches at upper corners to fit around floor unit framing. The strengthening members span the width of the floor unit at approximately equal spacing immediately below the floor surface. The spacing coincides with the spacers between the two plywood sheets of the floor and hence with the nail rows in the floor unit. The strengthening members are nailed to the floor unit with 8d nails at 12 inches on centers, and to the sides of the floor unit with three 16d duplex-head nails at each end of the member.

#### PACKAGING

For shipment by any type of carrier, strengthening members and the necessary nails are banded together in required quantities not to exceed eight floor units or one 16-foot module per package. Reinforcement for one floor unit weighs 60 pounds. The package is 5-3/4 inches by 9-3/4 inches by 3 feet 9-3/4 inches with a cube of 1-1/2 cubic feet. The weights and cubes for 16-, 32-, and 48-foot modules are given in Table I.

Table 1. Weight, Cube, and Cost of Floor-Strengthening Kit

Building Size	Shipping Weight (lb)	Cube (ft <sup>3</sup> )	Cost (\$)
one floor unit	60	1.5	3
one 16-foot module	480	12.0	24
one 32-foot module	960	24.0	48
one 48-foot module	1,440	36.0	72

#### COST

Based on 1962 Laboratory fabrication costs, the price of reinforcing members for one floor unit is \$3. The costs for 16-, 32-, and 48-foot modules are given in Table 1.

#### EVALUATION

The timber strengthening members for the floor panels must be installed at the time of erection since the floor units serve as packing crates for the insulated blanket cover. If it becomes necessary to move the building, these members can be easily removed as they are secured with duplex-head nails.

A test installation of the strengthening members required 15 minutes per floor unit. It is estimated that cutting, notching, and installing the members for one floor panel in the field using hand tools and available material would require about one manhour.

#### FINDINGS

The floor-strengthening members developed for reinforcing the Jamesway floor units are:

1. Effective in reducing deflections to 0.25 inch under a concentrated loading of 1,000 pounds.
2. Suitable for fabrication in small woodworking shops.



3. Easy to install under field conditions.
4. Easily packaged for shipment in all types of carriers including cargo aircraft.

#### CONCLUSIONS

1. A heavy-duty floor can be achieved by reinforcing the standard Jamesway floor panels with transverse strengthening members.
2. Heavy-duty floor panels should be used in all Jamesways housing heavy galley equipment, communication gear, electrical generators, and other concentrated loads.
3. The floor-strengthening kit described in this report should be adopted as a standard accessory for the Jamesway.

#### PART III. SPECIAL FOUNDATION SYSTEM

Jamesway foundations, consisting of 2 x 6 wood sills parallel to the longitudinal axis of the building at the edges and the center, were found to be inadequate for use on underlying media of deep snow, ice, or permafrost. When a Jamesway is used to house utility equipment and other heavy items, the load must be distributed over a larger bearing area than that provided by timber sills. Heat-producing equipment also presents a problem<sup>1,2</sup> as this causes cavitation under the floor resulting in excessive settlement and even collapse of the building. The most critical cavitation is usually under the center.

#### CRITERIA

To increase the useful load-bearing capacity of a Jamesway, a foundation system is needed to distribute the floor loads over a larger area. Such a system should not require support at the center of the building where cavitation is most critical, and a vented air space is needed below the floor to retard melting.

Specific criteria were developed for such a foundation system. These criteria, which are supplemental to the requirements of the general criteria, were:

1. Bearing support only along the edges of the building.
2. A unit floor loading of 50 pounds per square foot.
3. A bearing not to exceed 3 psi on underlying media.
4. A vented air space below the floor.
5. Insulation between the vented air space and the underlying media.

#### DESIGN

Based on the above criteria, a foundation system was developed for the Jamesway (Figures 5 and 6). The design employed transverse joists at 4-foot spacing to transmit the load to the edges of the building. Open-web steel joists were used to permit circulation of air. The joists bear on steel I-beams which also serve to prevent snow from drifting into the air space below the floor. Timber sills were used under the I-beams to spread a floor load of 50 pounds per square foot for a sill bearing of 2.74 psi.

To further retard cavitation, the air space was vented at 8-foot intervals along each side of the building, and a 2-inch fiberglass insulation blanket was provided between the vented air space and the underlying media. The insulation and vents are optional accessories for use when cavitation is especially critical.

The original design of the standard Jamesway foundation did not provide large enough tolerances for ease of installation of the floor units. The widths of the floor units were found in general to be greater than 4 feet. This dimension varied as much as  $3/8$  inch. The additional width accumulated over several building sections required a large tolerance in the brackets holding the floor units. Consequently the brackets in the original design, which were  $2-5/8$ -inch channels 7 feet long, were changed to two  $3-1/2$ -inch channels 6 inches long. The original foundation with cross bridging at the third points of the joist span was more rigid than necessary, therefore bridging was provided only at the center of the span in the final design.

The basic unit for the special foundation was designed for a 16-foot-long building, with 16-foot extension units for expansion.

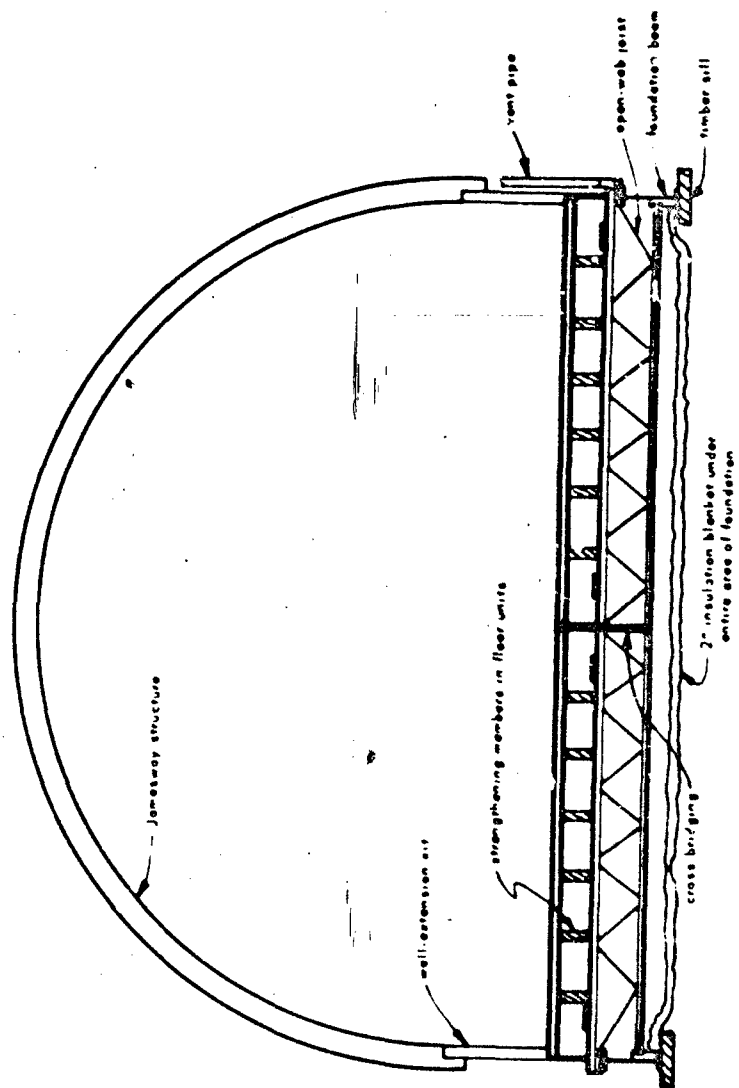


Figure 5. Cross section of special foundation.

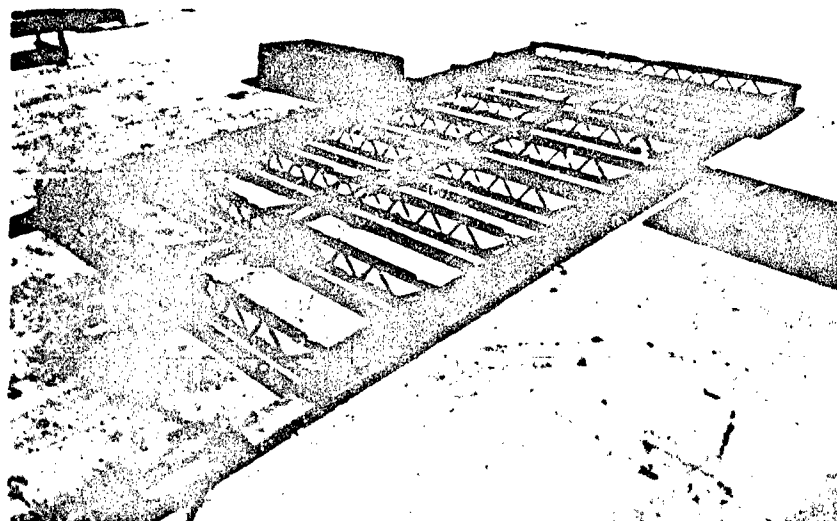


Figure 6. Special foundation system for 32-foot Jamesway.

#### DESCRIPTION

The special foundation system for the Jamesway, in its final design, is detailed in Y&D Drawing No. 936916 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Laboratory Technical Note N-482.<sup>5</sup>

The open-web joists, which span the width of the building at 4-foot intervals, weigh 124 pounds each. These members are made from 1-1/2 x 1-1/2 x 1/8 steel angles back to back for top and bottom chords, and circular steel bars for diagonals. The upper chord is 17 feet long; the lower chord is 16 feet 1 inch long. Total depth of the joist is 1 foot. The diagonals used at the ends of the joists are 5/8 inch in diameter; the remainder are 1/2 inch in diameter. Four 6-inch-long light-gage steel channels are welded to the top of each joist to receive the floor units. Bridging plates are welded to the center of the joists for attaching cross bridging along the longitudinal centerline of the foundation. The bridging is made of 1-1/4 x 1-1/4 x 1/8 steel angles.

The foundation beams, made of 12B14 steel I-beams, consist of two 16-foot 5-inch members for the basic foundation and two 15-foot 11-3/4-inch members for each such extension. The beams for the basic unit weigh 238 pounds each. Connecting plates to receive the joists are located on the bottom flange of each beam at 4-foot intervals. The bottom chord of the open-web joists is bolted to these connecting plates; the top chord is bolted directly to the top flange of the beams (Figure 7). In multiple assembly the foundation beams along each side of the building are bolted together with connecting plates welded to one end of each beam. The foundation beams are nailed to the 3- by 12-inch timber sills through holes in the bottom flange. Sills for the basic 16-foot unit are 18 feet long; sills for the extensions are 16 feet long.

The 2-inch fiberglass insulation blanket is laid on the underlying media under the entire area of the foundation system. Vent pipes are used at 8-foot centers along the sides of the building to ventilate the space between the building floor and the insulation. The vents are made of 2- by 4-inch 18-gage pipe. A short horizontal section of vent, which is located just below the floor, is connected to a short vertical section of vent with a slip-type elbow. The vertical section extends about 1-1/2 feet up the side of the building.

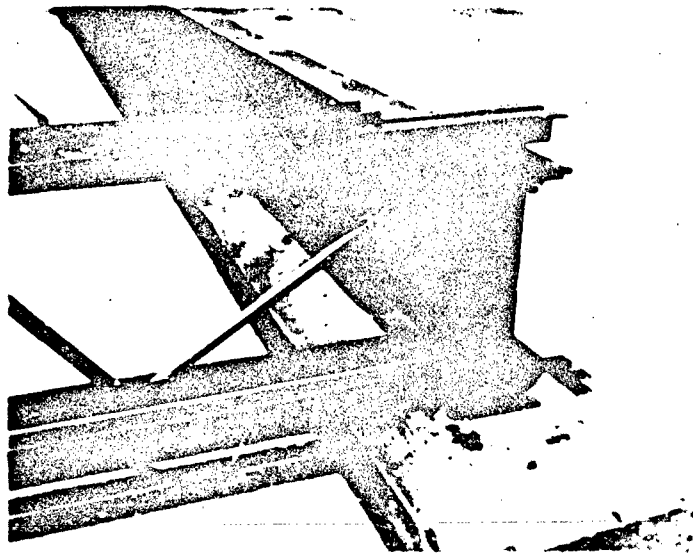


Figure 7. Joist-to-beam connection.

## PACKAGING

For shipment by any type of carrier, each 16-foot module of the special foundation system is packaged separately. Timber sills are banded together. Steel beams are banded together with bridging angles secured to the web of one beam section (Figure 8). Joists are banded together with wood block spacers at each end (Figure 9). Plywood filler strips are placed in the channels to protect the channel legs. Wood blocking is used in all places where banding would otherwise be stretched over edges of steel members. The packaging plan for the basic unit and the extension are shown in Table II. The weights and cubes of foundations for 16-, 32-, and 48-foot buildings are shown in Table III.

## COST

Based on 1962 Laboratory fabrication costs, the price of the basic 16-foot foundation unit is \$770; the price of one extension is \$670. The costs of foundations for 16-, 32-, and 48-foot buildings are given in Table III.

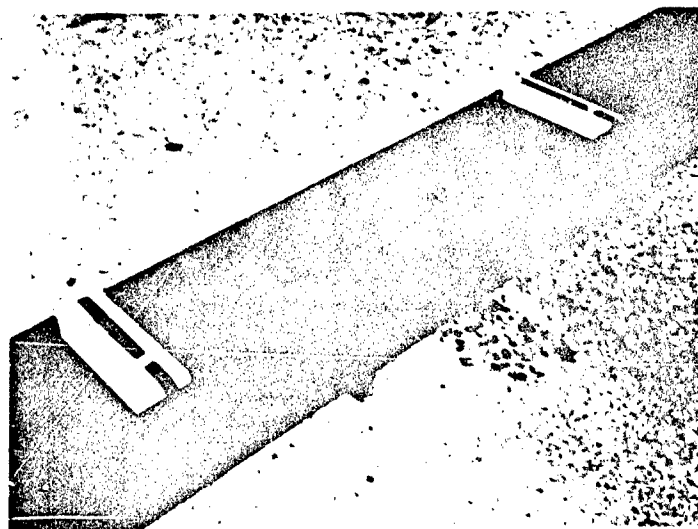


Figure 8. Foundation bridging and beams packaged for shipment.

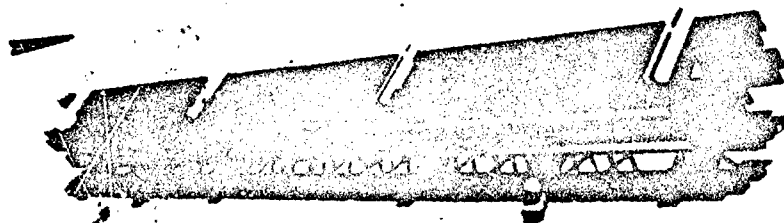


Figure 9. Foundation joists packaged for shipment.

Table II. Packaging Plan for Special Foundation System

Package No.	Components	Basic 16-Foot Unit			Cube (ft <sup>3</sup> )	Weight (lb)
		Length	Width	Height		
1	2 joists	17' 4"	1' 1-1/2"	10 1/4"	16.18	270
2	3 joists	17' 4"	1' 1-1/2"	1' 1-3/4"	22.64	400
3	2 beams 8 angles	16' 2-1/2"	1' 0"	9-1/4"	12.49	520
4	2 timber sills	18' 0"	11-1/2"	5-1/2"	7.74	302
	TOTALS				59.05	1,492
Package No.	Components	16-Foot Extension Unit			Cube (ft <sup>3</sup> )	Weight (lb)
		Length	Width	Height		
1	4 joists	17' 4"	1' 1-1/2"	1' 5-1/4"	27.90	530
2	2 beams 8 angles	16' 2-1/2"	1' 0"	9-1/2"	12.49	520
3	2 timber sills	16' 0"	11-1/2"	5-1/2"	7.74	270
	TOTALS				48.13	1,320

Table III. Weight, Cube, and Cost of Special Foundation System

Building Size	Shipping Weight (lb)	Cube (ft <sup>3</sup> )	Cost (\$)
one 16-foot module	1,490	59	770
one 32-foot module	2,810	107	1,440
one 48-foot module	4,130	155	2,110

#### EVALUATION

Design calculations show the joists of the special foundation system to be capable of supporting a floor load of 50 pounds per square foot. This load is distributed for a sill bearing under 3 psi. In order to support this load the floor-strengthening members described in Part II must be used in conjunction with the special foundation system.

A prototype foundation for a 32-foot Jamesway was fabricated and erected. Two men completely assembled the foundation in two hours. All members were easily handled by two men.

#### FINDINGS

The special foundation system developed for supporting Jamesways which have a high floor-loading intensity is:

1. Supported only at the edges of the building with no bearing support required at the center of the building where cavitation is most critical.
2. Designed to distribute a floor load of 50 pounds per square foot to the outside edges of the building, with a maximum sill bearing of less than 3 psi.
3. Suitable for fabrication in small welding shops.
4. Simple and easy to erect with hand labor.
5. Easily packaged for shipment in all types of carrier, including cargo aircraft.



## CONCLUSIONS

1. Bearing support under the center of the Jamesway where cavitation is most critical can be eliminated by using the special foundation system.
2. Heavy loads can be distributed for acceptable bearing values on underlying media by using the special foundation system.
3. The special foundation system should be used with all Jamesway buildings housing heavy galley equipment, communication gear, electrical generators, and other heavy loads or heat-producing equipment.
4. The special foundation system described in this report should be adopted as a standard accessory for the Jamesway.

## PART IV. WALL-EXTENSION KIT

One of the most obvious limitations of the Jamesway is the insufficient headroom along the sides of the building for optimum space utilization.<sup>2, 3</sup> The unusable floor space is approximately 15 percent of the gross floor area. The low profile of the arch ribs results in restricted use and arrangement of Navy standard double bunks, difficulty in giving desired separation between facilities, and limited versatility. Coupled with the above is a high floor-to-ceiling temperature gradient and poor air distribution.

### CRITERIA

The height of the ceiling needed to be raised sufficiently for adequate headroom at the edges of the shelter. In addition to meeting the requirements of the general criteria, a minimum increase of 2 feet in height of the arch ribs above the floor level was required.

### DESIGN

Based on the above criteria, an adapter was developed to raise the arch ribs by means of 2-foot wall panels completely around the perimeter of the building, thus creating a sidewall in the structure (Figure 10). The panels were designed to rest directly on the floor, and connectors were provided to mount the arch ribs on top of the panels.

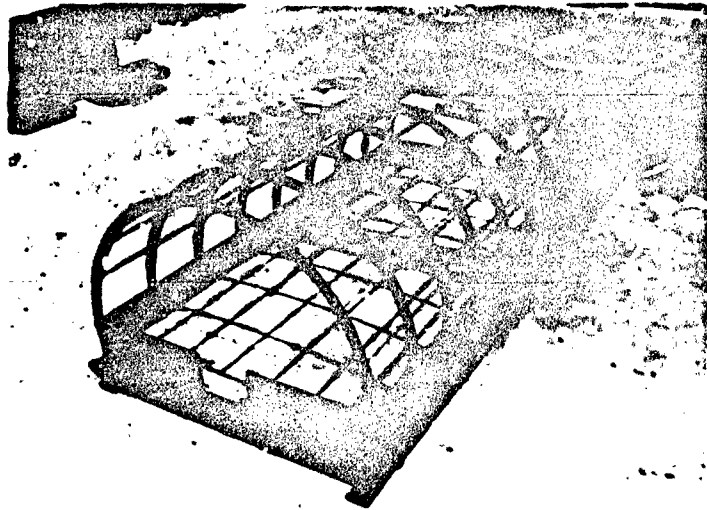


Figure 10. Wall-extension kit on a 16-by 32-foot Jamesway.

Two basic types of wall-extension panels were designed using wood framing and plywood skin. Panels for the endwalls were designed to fit between the door and the corners of the building. Panels for the sidewalls were designed in 8-foot lengths, which allowed the building length to be expanded in multiples of 8 feet.

Modifications required in the basic structure to receive these wall-extension panels included:

1. Field-trimming the bottom of the door jambs approximately 2 inches.
2. Dropping the entrance doors into the space between the endwall-extension panels and sealing the space above the door.

#### DESCRIPTION

The Jamesway wall-extension kit, in its final design, is detailed in Y&D Drawings No. 936903 through 936905 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Laboratory Technical Note N-482.<sup>5</sup>

The 2-foot-high extension panels, which are constructed of wood framing and 1/4-inch plywood skin, are 2-1/8 inches thick. The panels are filled with aluminum-foil-covered fiberglass blanket insulation 1-1/2 inches thick.

Plates and spring-loaded link-lock fasteners connect the panels to the outer edge of the floor sections (Figure 11). The arch ribs are secured to the top of the panels with carriage bolts and wing nuts, and the roof blanket tiedown straps are secured to a wooden tiedown bar on the panels. The vertical joints between panels are sealed with plywood battens nailed to the interior surface. The horizontal joint between the blanket cover and the panels is sealed with a wooden slat which is also nailed to the interior surface of the panels.

The wall-extension panels are made in two lengths. The endwall panels, which include right-hand and left-hand units, are 6 feet 6 inches long. All sidewall panels are 8 feet long.

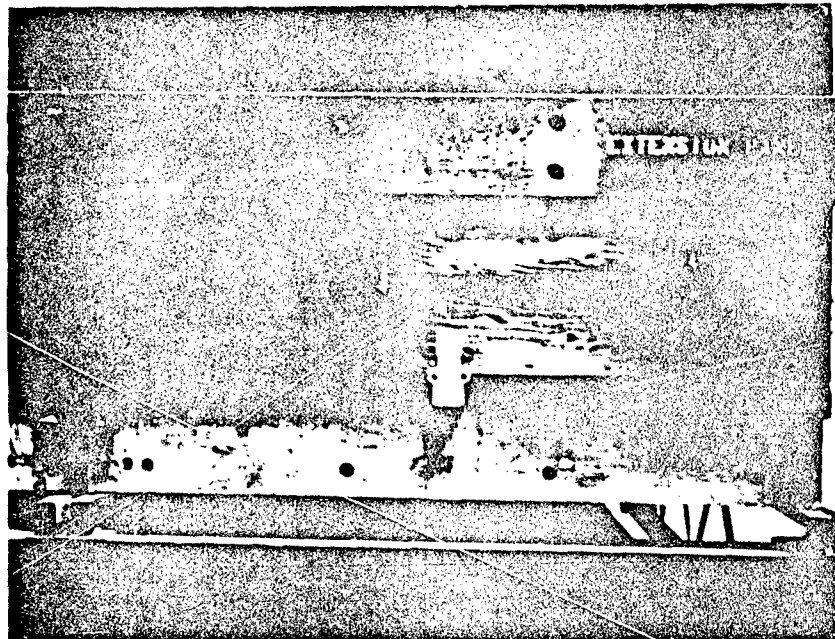


Figure 11. Connection of a wall-extension panel to a floor panel.

## PACKAGING

For shipment by any type of carrier, the four end panels and the door-conversion members required for a building are packaged together (Figure 12). The entire package is 6 feet 8 inches long, 2 feet 6 inches wide, and 1 foot 3 inches high with a volume of 21 cubic feet. The packaged weight is 270 pounds.

The side panels are packaged in groups of four. The entire package is 8 feet long, 2 feet 7 inches wide, and 1 foot high with a volume of 20 cubic feet. The packaged weight is 284 pounds.

The weights and cubes for 16-, 32-, and 48-foot modules are given in Table IV.

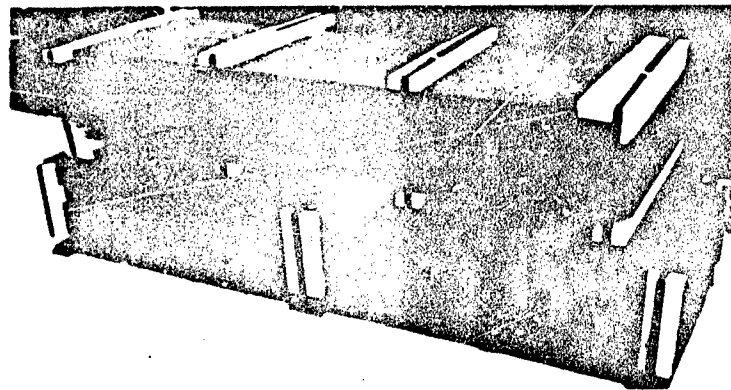


Figure 12. Wall-extension kit for a 16-by 16-foot Jamesway packaged for shipment.

Table IV. Weight, Cube, and Cost of Jamesway Wall Extensions

Building Size	Shipping Weight (lb)	Cube (ft <sup>3</sup> )	Cost (\$)
one 16-foot module	554	41	680
one 32-foot module	838	61	1,000
one 48-foot module	1,122	81	1,320

## COST

Based on 1962 Laboratory fabrication costs, the price of the endwall panels and door-conversion members for one building is approximately \$360. The price of the sidewall panels for a 16-foot building is \$320. The costs for 16-, 32-, and 48-foot modules are given in Table IV.

## EVALUATION

In January 1961, a prototype wall-extension kit was fabricated and shipped to Thule, Greenland, for use with a Jamesway headquarters building for Project Ice Way.<sup>6</sup> The kit caused no problems in erection and no deficiencies were observed during three months of use. The building was used to house various types of supplies and equipment not otherwise possible without the increased cube and overhead clearance created by the wall panels.

The prototype pioneer quarters structure developed for a 25-man pioneer polar camp used a Jamesway with wall-extension panels.<sup>7</sup> The use of these panels permitted more versatility in arrangement and a maximum use of floor space in the quarters. The prototype was shipped to McMurdo, Antarctica, and erected by MCB-1 in October 1961. The building was occupied by the officers of MCB-1 and three Laboratory personnel for about four months. The consensus was that the building was weathertight and very comfortable even for double bunks. The wall extensions received much favorable comment.

A prototype Jamesway wall-extension kit for a 32-foot building was fabricated and erected at Port Hueneme, California, by four men in two hours, for a total of eight manhours.

## FINDINGS

The wall-extension kit developed for better utilization of floor space in the Jamesway building is effective in:

1. Making the entire floor area usable.
2. Permitting the use of standard outfitting.
3. Allowing flexibility in interior arrangement.
4. Reducing the high temperature gradient normally associated with Jamesways.

The kit is:

1. Suitable for fabrication in small woodworking shops.
2. Simple and easy to erect with hand labor.
3. Easily packaged for shipment in all types of carriers including cargo aircraft.

#### CONCLUSIONS

1. Adequate headroom can be obtained at the edges of a Jamesway shelter by using the wall-extension kit.
2. The headroom achieved with the wall-extension kit permits optimum space utilization and greater flexibility of arrangement than is possible in the standard Jamesway.
3. The wall-extension kit described in this report should be adopted as a standard accessory for the Jamesway.

#### PART V. SPECIAL ENTRIES

In 1960 the Jamesway was selected as the basic building for a packaged pioneer polar camp being developed by the Laboratory.<sup>7</sup> Development of the camp revealed a lack of flexibility in placement of entries, and restricted entry when the standard vestibule is used. Two special entries were developed to remedy these limitations.

##### SIDE-ENTRY KIT

The Jamesway has entrance doors only at the center of the endwalls. This limitation restricts the interior arrangement and requires that the camp layout provide for access to the ends of all buildings.

##### Criteria

In development of the pioneer polar camp, a special side entry was needed to provide flexibility of door placement. In addition to meeting the requirements of the general criteria, the entry had to be suitable for use at any place along the side of the building.

### Design

Based on the above criteria, a vestibule-type side entry of wood framing and plywood was designed to fit between two arch ribs (Figures 13 and 14). The design was such that one roof blanket could be rolled back to provide room for the vestibule. This eliminated the necessity of cutting a blanket. A blanket tiedown was designed for attaching the roof blanket to the vestibule roof. For installation in a Jamesway fitted with wall extensions, a 4-foot-long wall-extension panel was designed to replace the normal 8-foot extension panel in order to accommodate the 4-foot width occupied by the vestibule.

### Description

The side-entry kit for the Jamesway, in its final design, is detailed in Y&D Drawings No. 936907 through 936912 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Laboratory Technical Note N-482.<sup>5</sup>

The side-entry vestibule is a plywood compartment 3 feet 10 inches wide, 3 feet 6-3/4 inches deep, and 6 feet 7-1/4 inches high. It sits on a Jamesway floor unit with its outer wall flush with the edge of the building. The door in the outer wall of the vestibule opens out, and the door in the inner wall opens into the building. Closure strips of 1/4-inch plywood and 1/8-inch felt shaped to fit the curvature of the arch are attached to the exterior of each sidewall for a snug fit between the vestibule and the arch ribs. For a Jamesway fitted with wall extensions, special wood filler strips are provided for filling the spaces between the extension panels and the sidewalls of the vestibule.

The tiedown assembly for securing the roof blanket to the vestibule roof is shown in Figure 15. A wooden tiedown bar, hinged near the center, is inserted between the two arch ribs at the point of intersection with the vestibule roof. Spiked steel plates at the outer ends of the bar bite into the arch ribs, and the bar is held in place by a barrel bolt opposite the hinge. The unused portion of the blanket is folded on top of the vestibule and tied down with web straps.

### Packaging

For shipment by any type of carrier, the four walls of the side-entry kit and the special wall-extension panel are banded together, with all smaller parts placed between the wall sections (Figure 16). This package is 3 feet 10-1/2 inches wide by 6 feet 7-1/2 inches long by 14-1/2 inches high with a total volume of 27 cubic feet. The packaged weight is 330 pounds.

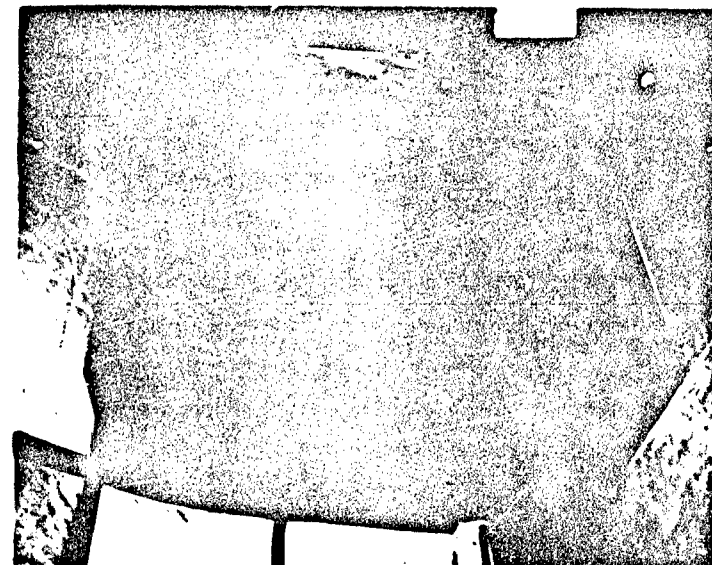


Figure 14. Interior view of side entry.

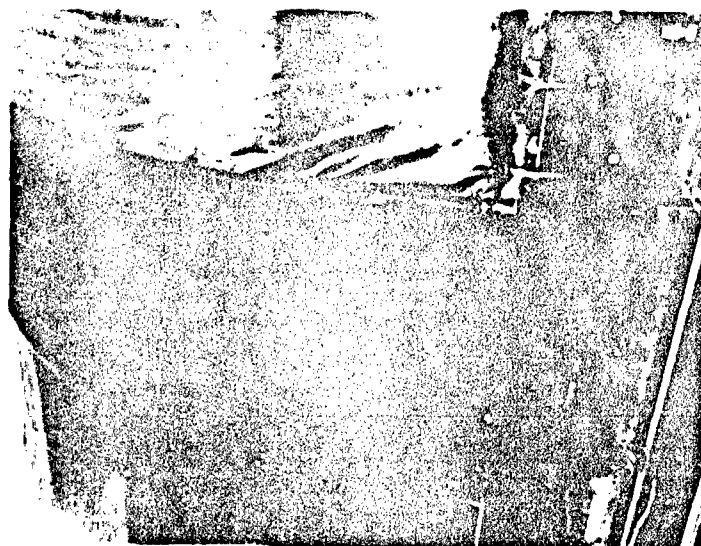


Figure 13. Exterior view of side entry.





Figure 15. Blanket tiedown for a side entry.

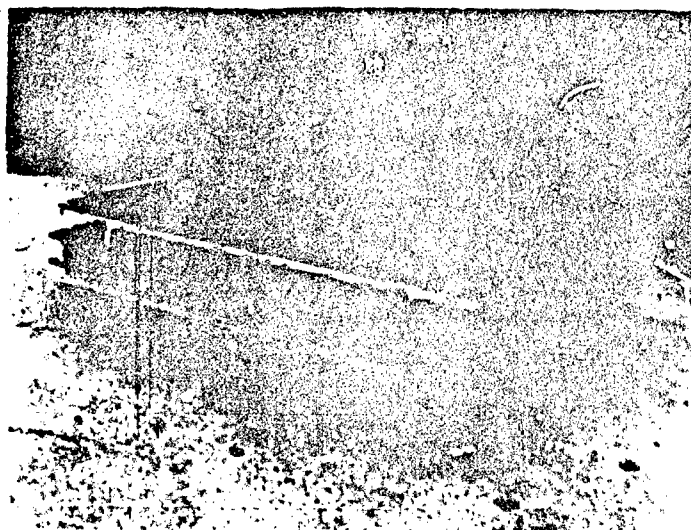


Figure 16. Side-entry kit packaged for shipment.

#### Cost

Based on 1962 Laboratory fabrication costs, the price of one side-entry kit including a special wall-extension panel is \$470.

#### Evaluation

A type of side entry was used on the Greenland icecap in 1954.<sup>2</sup> A passageway was constructed between the recreation building and a quarters building by using standard Jamesway arches covered with canvas to connect the two buildings end to end. A dormer was field-fabricated in the side of the passage to accommodate the side-entry door. This entry afforded the convenience of access to the center of the two-building complex without going to one of the ends, which were 72 feet apart. The side-entry kit provides a similar dormer-type entry prefabricated for easy field installation.

A prototype side-entry kit for use with the wall extensions was fabricated and erected. It was assembled and installed in a previously erected Jamesway by two men in two hours. Erection was very simple, requiring no special tools or skills.

#### STANDARD VESTIBULE END-ENTRY KIT

The standard Jamesway vestibule has an outer door which opens to the side. After entering the vestibule, a 90-degree turn is required before entering the building. This does not permit entering the building with large furniture or equipment, or with an injured man on a stretcher.

#### Criteria

A means was needed to permit direct entry into a Jamesway through the end of the vestibule. In addition to meeting the requirements of the general criteria, the direct entry had to be sized to the endwall of the vestibule.

#### Design

Based on the above criteria, a plywood door panel was designed to replace the canvas endwall of the Jamesway vestibule (Figure 17).

#### Description

The end-entry kit for the standard Jamesway vestibule, in its final design, is detailed in Y&D Drawing No. 936913 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Laboratory Technical Note N-482.<sup>5</sup>

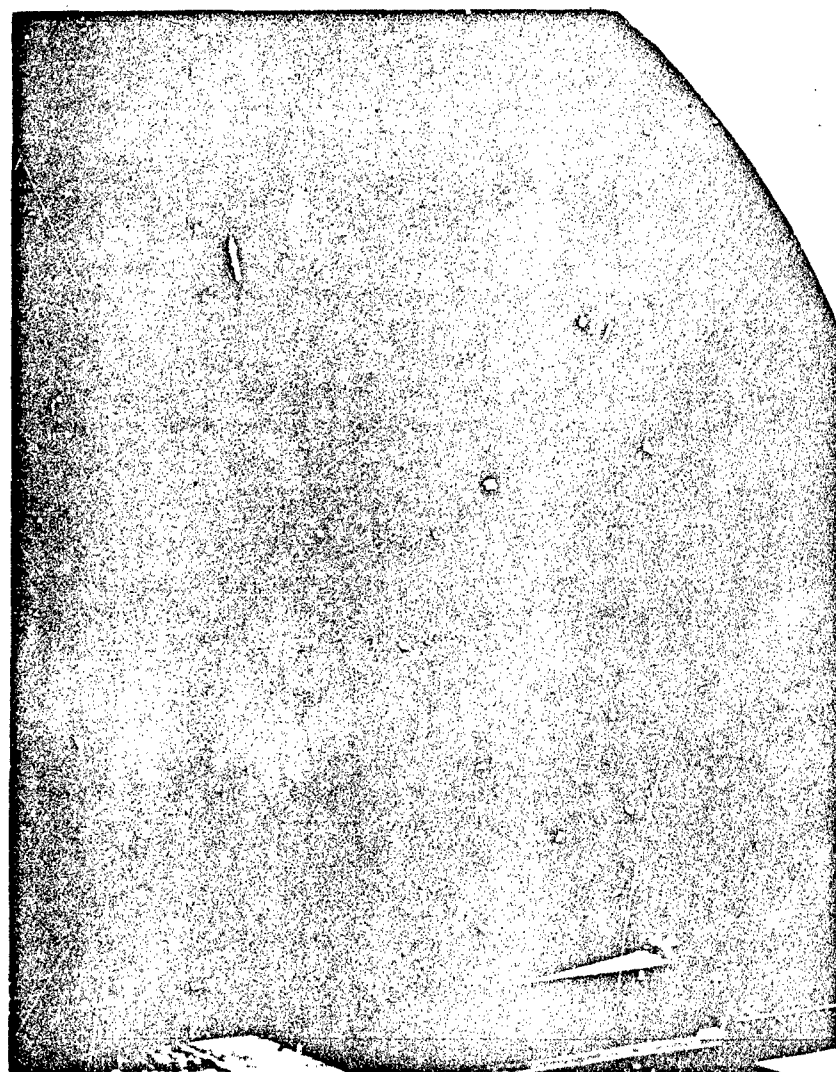


Figure 17. Exterior view of a standard vestibule end entry.

The kit consists of a plywood panel 3 feet  $\frac{3}{4}$  inch wide and 6 feet  $11\frac{5}{8}$  inches high framing an insulated, plywood door 2 feet 8 inches wide by 6 feet  $5\frac{3}{4}$  inches high. The panel is attached to the end of the vestibule with screws. The door opens outward and is secured by a latch and keeper which is operable from both sides.

#### Packaging

For shipment by any type of carrier, the end-entry kit is banded to secure the door and protect the latch (Figure 18). This produces a package 3 feet  $\frac{1}{2}$  inch wide by 7 feet long by  $6\frac{1}{4}$  inches high with a volume of 11 cubic feet. The packaged weight is 85 pounds.

#### Cost

Based on 1962 Laboratory fabrication costs, the price of one standard Jamesway vestibule end-entry kit is \$165.

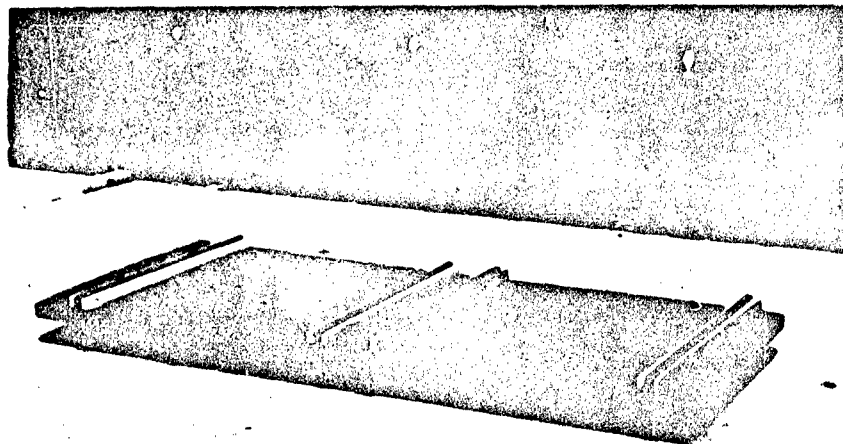


Figure 18. Standard vestibule end-entry kit packaged for shipment.

### Evaluation

The standard vestibule end entry provides an opening for items up to 2 feet 8 inches wide by 6 feet 5-3/4 inches high. Direct passage through the vestibule permits easy entry with long items such as lockers which would otherwise have to be stood on end and laboriously angled through the vestibule. The lengths of admitted items are no longer a problem.

A prototype end entry was fabricated and installed in the vestibule of a Jamesway. Two men installed the panel in one-half hour. Installation required no special tools or skills.

### FINDINGS

1. The side-entry kit is:
  - a. Effective in providing a side entrance to a Jamesway.
  - b. Suitable for fabrication in small woodworking shops.
  - c. Simple and easy to erect with hand labor.
  - d. Easily packaged for shipment in all types of carriers including cargo aircraft.
2. The standard vestibule end-entry kit is:
  - a. Effective in providing a direct entry into a Jamesway through the standard vestibule.
  - b. Suitable for fabrication in small woodworking shops.
  - c. Simple and easy to install with hand labor.
  - d. Easily packaged for shipment by any type of carrier including cargo aircraft.

## CONCLUSIONS

1. Entry along the side of a Jamesway can be achieved by using a side-entry kit.
2. Side entry permits greater flexibility of interior arrangement and camp layout than is otherwise possible.
3. Direct entry through the standard Jamesway vestibule can be achieved with an end-entry kit.
4. End entry through the standard vestibule provides entrance for large furniture, heavy equipment, and stretchers.
5. The special entries described in this report should be adopted as standard accessories for the Jamesway.

## PART VI. IMPROVED ELECTRICAL DISTRIBUTION SYSTEM

The standard Jamesway electrical system is inadequate for most uses and not flexible enough for special applications. The system has no provision for exit and vestibule lights or additional circuits. Lights controlled only at one end of the building are also very inconvenient.

### CRITERIA

Specific criteria were developed for improving the electrical distribution system. These criteria, which are supplemental to the requirements of the general criteria, were:

1. Basic system with lights and duplex outlets at 8-foot intervals at the crown of the arch.
2. Exit and vestibule lights.
3. Switches at both ends of the building, each controlling a portion of the lights.
4. Provision for additional circuits if needed at a later date.

## DESIGN

Based on the above criteria, an electrical distribution system with two circuits was designed for 32- and 48-foot Jamesways. One circuit supplies duplex outlets spaced 8 feet apart at the crown of the arch (Figure 19). The other circuit supplies all of the lights. In addition to a light below each duplex outlet, the system was designed for a night light above each door, a light in each vestibule, and an outside light above each vestibule (Figure 20). Two of the ceiling lights are controlled by a switch below the distribution panel. The remainder are controlled by a switch at the opposite end of the building. A ten-circuit distribution panel was provided to permit addition of circuits for special applications.

The system is outfitted with the designed sections of rigid and flexible conduit containing the required number of wires and connected to a junction box at one end. A bracket was designed for hanging the junction boxes from the arch ribs.

## DESCRIPTION

The improved electrical distribution system, in its final design, is detailed in Y&D Drawing No. 936906 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Laboratory Technical Note N-482.<sup>5</sup>

Powerlines from an outside power source enter the building through a service head assembly (Figure 20). Conduit straps are used to secure this assembly to the building. The powerlines are connected to a ten-circuit distribution panel, which is located adjacent to the door frame.

Flexible conduit is used for all wiring at the ends of the building. This includes lines to the vestibule lights, the exit lights, switches, and the junction boxes located 8 feet from the endwalls at the crown of the arch ribs. Connections between junction boxes at the crown of the arch are made with thin-walled rigid steel conduit 7 feet 9 inches long. The conduit and wire are connected at one end to a junction box to form a subassembly. Fast assembly is provided at the opposite end by the use of wire connectors and flexible conduit connectors.

The bracket for hanging the junction box is 16-gage steel 1-1/2 inches wide, bent at a right angle with 2-inch legs. One leg is bolted to the back of the junction box; the other is attached to the side of an arch by a No. 10 wood screw at the time of erection.

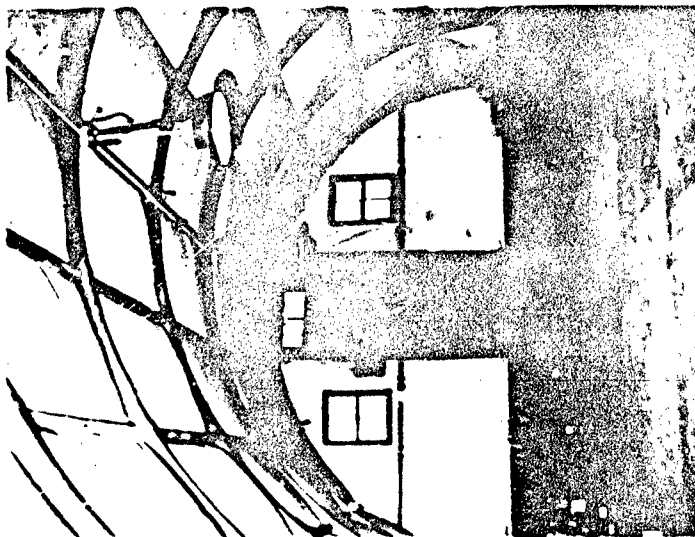


Figure 19. Improved electrical distribution system installed in a Jamesway.

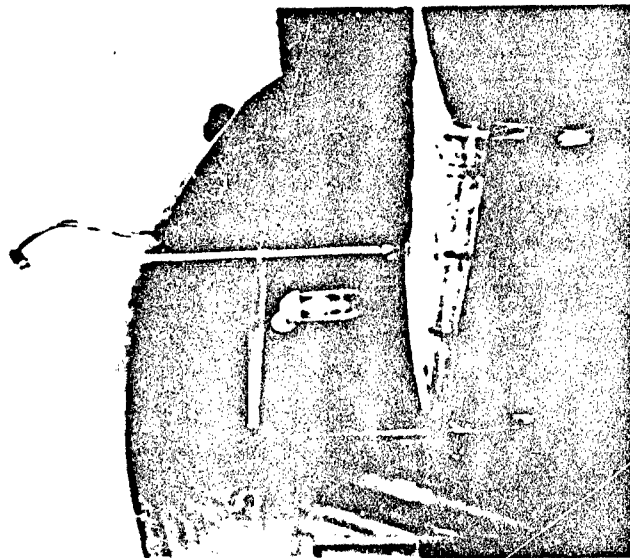


Figure 20. Outside light and service head assembly provided in the improved electrical distribution system.



An outlet and lamp assembly is connected to each junction box located at the crown of the arch. This assembly includes a "C" conduit, complete with duplex receptacle, a 12-inch section of rigid conduit, and a lamp fixture supported at the lower end of the rigid conduit. The entire assembly is wired so that the only connections required at the time of erection are connecting the wires and fastening the cover to the junction box.

A switch assembly is located at each end of the building adjacent to the door frame. The assembly contains two switches; one controls the outside light, and the other controls a portion of ceiling lights. The vestibule and night lights are switched at the fixture.

#### PACKAGING

For shipment by any type of carrier, the entire electrical distribution system is packaged in a plywood box. The package for a 32-foot Jamesway is 2 feet wide by 1 foot 5-1/2 inches high by 8 feet long with a volume of 24 cubic feet. The packaged weight is 200 pounds. The estimated cube of the package for a 48-foot Jamesway is 26 cubic feet and the estimated weight is 225 pounds.

#### COST

Based on 1962 Laboratory fabrication costs, the estimated price of a general electrical system is \$400 for a 32-foot Jamesway and \$450 for a 48-foot Jamesway.

#### EVALUATION

The prototype pioneer quarters structure developed for a 25-man pioneer polar camp used a Jamesway outfitted with a five-circuit electrical distribution system.<sup>7</sup> The system was made up of prewired sections of lightweight conduit. The wiring was connected to form a complete harness which could be folded at breaks in the conduit for shipment. Several deficiencies were observed during field erection and use at McMurdo, Antarctica:

1. Edges of the conduit cut the insulation on the wire during shipment.
2. The harness could not be unfolded for installation at cold temperatures without damaging the insulation.

3. The five circuits supplying three rows of outlets and two rows of lights were excessive.
4. Vestibule lights were needed.

To overcome these deficiencies the general electrical system in its final design has only one row of lights and outlets supplied by two circuits. Lightweight conduit sections are prewired, but the wire for each section must be field-connected to the adjacent section. Vestibule lights were included in the system. The improved electrical distribution system utilizes the same basic approach employed in the prototype tested at McMurdo, with simplifications and improvements suggested by field evaluation.

A general electrical system for a 32-foot building was fabricated and installed in a previously erected Jamesway. The system was installed by one man in four hours. No special tools or skills were required.

#### FINDINGS

The improved electrical distribution system is:

1. Effective in providing adequate wiring for general use.
2. Flexible for the addition of more circuits for special applications.
3. Suitable for fabrication in small shops.
4. Simple and easy to install with hand labor.
5. Easily packaged for shipment in all types of carriers including cargo aircraft.

#### CONCLUSIONS

1. An adequate electrical system for general use with the Jamesway can be obtained with the improved electrical distribution system.
2. The ten-circuit distribution panel in the improved electrical distribution system provides flexibility for the addition of circuits for special applications.
3. The improved electrical distribution system described in this report should be adopted as a standard accessory for the Jamesway.

## PART VII. SPECIAL UTILITY ACCESSORIES

During development of a packaged pioneer polar camp which utilizes the Jamesway as the basic building, the need of certain utility accessories became apparent. There are certain accessories necessary in all pioneer polar applications regardless of size, mission, or location. There must be a method of water supply, storage, and distribution within the building; there should be some provision for a toilet which can be used in a Jamesway; vents are often required at points other than at the ends of the building. Units developed to satisfy these needs included a water-storage tank, a snow melter, a dry head kit, and a special roof vent.

### WATER-STORAGE TANKS

The complexity and expense of providing a permanent water distribution system in polar regions makes the use of such a system impractical for pioneer polar operations. Water must be distributed periodically from the point of production to various points of usage by means of a temporary system such as a hose. This requires water-storage tanks at the usage points located at an elevation which will provide a gravity water distribution system within the buildings.

#### Criteria

Specific criteria were developed for providing elevated water storage in a Jamesway. These criteria, which are supplemental to the requirements of the general criteria, were:

1. Lightweight nestable tanks.
2. Capacity of approximately 200 gallons per tank.
3. Minimum of 6 feet 6 inches headroom below tank and supports.

#### Design

Water-storage tanks for use in Jamesways were designed as 190-gallon rectangular nestable tanks made of 1/8-inch aluminum plate stiffened by crimps. The cover is a stiffened flat plate which can be bolted to the tank.

A support for elevating the tank was designed using aluminum angles for legs, which are held in position at the top by aluminum plates, and at the bottom by base plates which are secured to the floor.

### Description

The water-storage tank and support, in their final design, are detailed in Y&D Drawing No. 936915 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Laboratory Technical Note N-482.<sup>5</sup>

**Tank.** The tank (Figure 21) is an open-top aluminum unit with sides and ends tapered inward 2 inches from top to bottom. The inside dimensions at the top are 2 feet 11 inches by 5 feet 11 inches; the depth is 1 foot 9 inches. The tank cover is 3 feet 3 inches by 6 feet 3 inches. A 2-inch flange around the top of the tank contains holes for bolting on the cover. All aluminum plate is stiffened by crimps 6 inches on centers.

Holes for filling and draining the tank are located in the bottom near each end and on each side near the top. The holes are 1-1/32 inches in diameter reinforced with 1/8-inch aluminum plate.

**Support.** A tank support (Figure 22) is provided when it is desired to elevate the tank for a gravity water supply system. The support consists of four aluminum-angle legs 7 feet 11-1/4 inches long fastened together at the top by aluminum plates on each side and welded at the bottom to 8-inch-square base plates which are fastened to the floor with screws. The base plates are centered at the corners of a 4-foot square. The bracing at the top is 3 1/2-inch aluminum plate 1 foot 1 inch high, bent at each edge to form a 2-1/2-inch flange at the top and a 1-1/2-inch flange at the bottom. Aluminum cross-bracing bars are placed diagonally across the top of the support.

The top of the mounted tank is approximately 6 inches below the crown of the arch in a Jamesway with wall extensions. The bottom of the bracing is 6 feet 7 inches above the floor, which allows sufficient headroom for traffic under the tanks.

### Packaging

For shipment by any type of carrier, the components of one tank support are banded together (Figure 23). This produces a package 1 foot 7 inches wide by 8 feet long by 9-3/4 inches high with a volume of 10 cubic feet. The shipping weight of one tank support is 140 pounds. One tank weighs about 85 pounds and occupies 22 cubic feet. As the tanks are nestable, all of the tanks shipped to a specific location should be nested together and shipped in one package.

### Cost

No costs are available for the water tanks. Based on 1962 Laboratory costs, the price of one tank support is \$252.

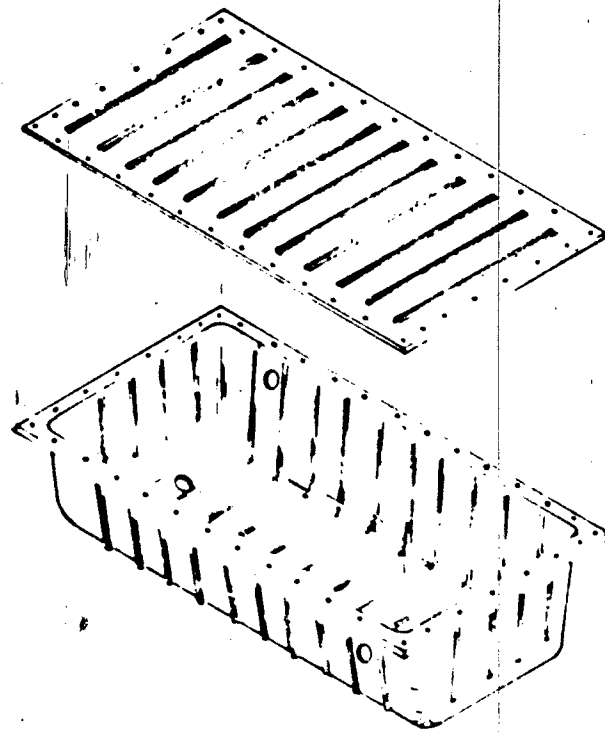


Figure 21. Nestable 190-gallon water-storage tank and cover.



Figure 22. Elevated support for water-storage tank.

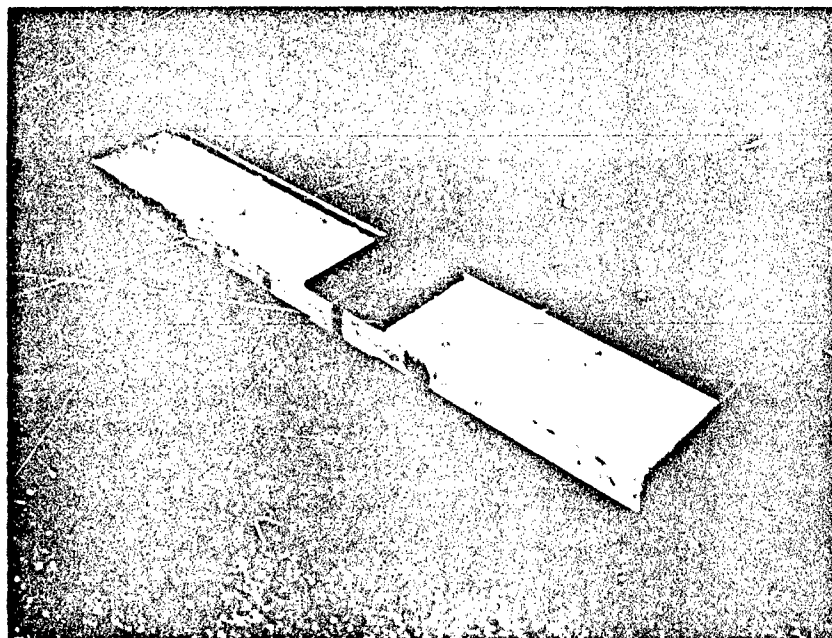


Figure 23. Elevated support for water-storage tank packaged for shipment.

#### Evaluation

Elevated water-storage tanks have been extensively used in remote areas, particularly to provide a simple gravity-flow system for showers. Such tanks elevated on pipestands were successfully used in the head and the galley in the Little America Station during Deep Freeze I and II to provide an adequate yet simple method of supplying all the fixtures in the building.<sup>3</sup> This type of water distribution system eliminates the requirement of mechanical equipment such as a pump or pressure tank which would require maintenance and repair. The water-storage tanks and supports described in this report are prefabricated units dimensioned to fit into a Jamesway with wall extensions.

A prototype tank support was fabricated and erected. It was erected by two men in one-half hour. No special tools or skills were required. The water tank requires no field assembly.

## SNOW MELTER

Snow melting in pioneer polar camps has been primarily by the use of portable snow melters placed in a snow field. This requires hauling the water from the snow field to various usage points. A snow melter which could be placed inside a building within a camp complex would permit easier storage, and a hose could be used to distribute the water to usage points.

### Criteria

The snow-melter requirements were based on supplying a maximum of 100 men using 10 gallons of water per day. Since the Jamesway building does not have an opening wide enough to admit a loader, a loading chute had to be provided. In addition to the requirements of the general criteria, specific criteria developed for a snow-melter tank and chute were:

1. Snow-melter capacity of approximately 100 gallons per hour.
2. Minimum width of chute, 6 feet.

### Design

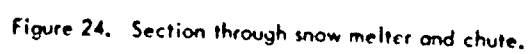
Based on the above criteria, an open-top, metal-lined tank was designed using timber and plywood. The tank (Figure 24) was designed for a water charge at all times by placing the drain 1 foot 6 inches above the bottom.

A 6-foot-wide chute was designed for supplying snow to the tank and provision was made for an opening in the endwall of the building to accommodate the chute. The chute (Figure 24) was designed as a hinged panel which opens to form the inclined bottom of the trough and closes when not in use to seal the opening in the building. An open-top plywood-panel framework was designed to project outside the building to form the chute sides.

Alterations required in the endwall of a Jamesway for installation of the chute are:

1. The door and frame are removed.
2. The canvas wall is cut to provide a 6-foot-wide opening.
3. Posts are installed at the sides of the opening.
4. The openings above and below the chute are closed with plywood panels.





### Description

The snow-melter tank and chute for the Jamesway, in their final design, are detailed in Y&D Drawing No. 936917 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Laboratory Technical Note N-482, 5

**Tank.** The snow-melter tank is a wood frame and plywood unit 4 feet wide by 6 feet long. The back side of the tank is 4 feet 6 inches high (Figure 25); the front is 3 feet high. The top edge of the ends slopes downward from back to front. The tank is insulated and lined with 1/8-inch aluminum.

The drain hole is 1-3/8 inches in diameter, centered in one end of the tank 1 foot 6 inches above the bottom. A 1-inch-diameter by 5-inch-long nipple is secured in the hole by lock nuts. A pipe can be attached for pumping water from the snow melter to storage tanks.

Two-by-four blocks extend the full length of the tank on the inside surface for using electric immersion heaters for melting the snow. One block is attached 3-1/2 inches below the top, the other 2 feet 1-1/2 inches below the top.

**Chute.** The sides of the chute are 3/4-inch plywood panels which screw to the ends of the snow melter and extend through the opening 4 feet beyond the endwall of the building (Figure 26). The chute is braced by 2 x 4's near the outermost end. A 2 x 3 stop is nailed to each side of the chute in position to support the hinged bottom panel when it is open to a 30-degree angle with the horizontal. The top edge of the hinged panel rests on the 2 x 4 bracing.

The hinged panel is 3/4-inch plywood 3 feet 6 inches by 6 feet. An 8-inch strip of plywood is nailed to the sill to provide a portion of the chute from the sill to the snow-melter tank. The panel is hinged to the 8-inch strip with four strap hinges. When closed, it is fastened by two chain bolts at the top.

### Packaging

For shipment by any type of carrier, all the plywood for the snow chute and building modification is banded together (Figure 27). The package is 4 feet wide by 8 feet long by 4 inches high with a volume of 11 cubic feet. The packaged weight is 245 pounds. All framing for the snow chute and building modification is banded together, producing a package 1 foot 2 inches wide by 10 feet long by 7 inches high with a volume of 7 cubic feet. The packaged weight is 130 pounds. The snow melter is 4 feet wide by 6 feet long by 4 feet 6 inches high with a volume of 108 cubic feet. The weight is 538 pounds. The total shipping weight for the melter and chute is 913 pounds. The total volume is 126 cubic feet.

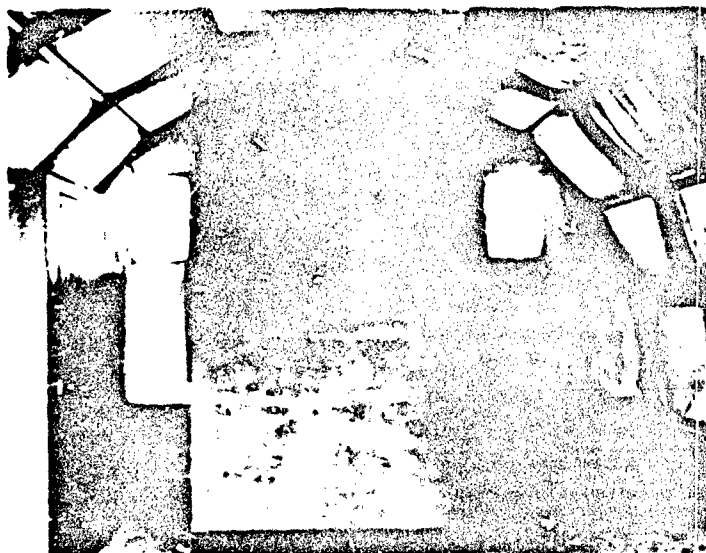


Figure 25. Snow melter installed in a Jamesway.

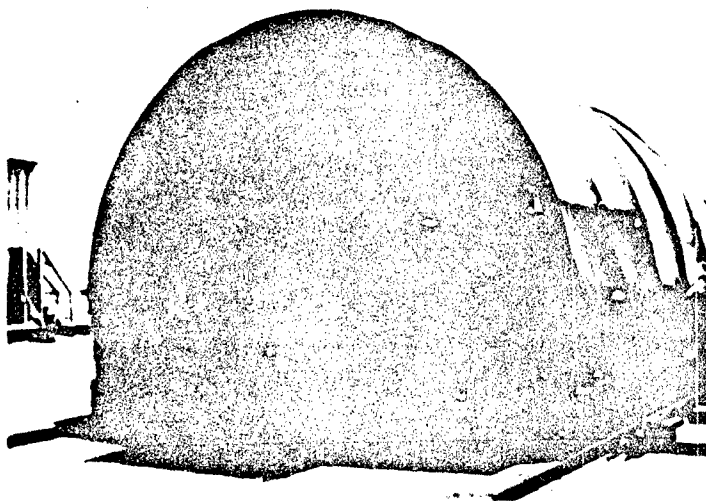


Figure 26. Snow-melter chute.

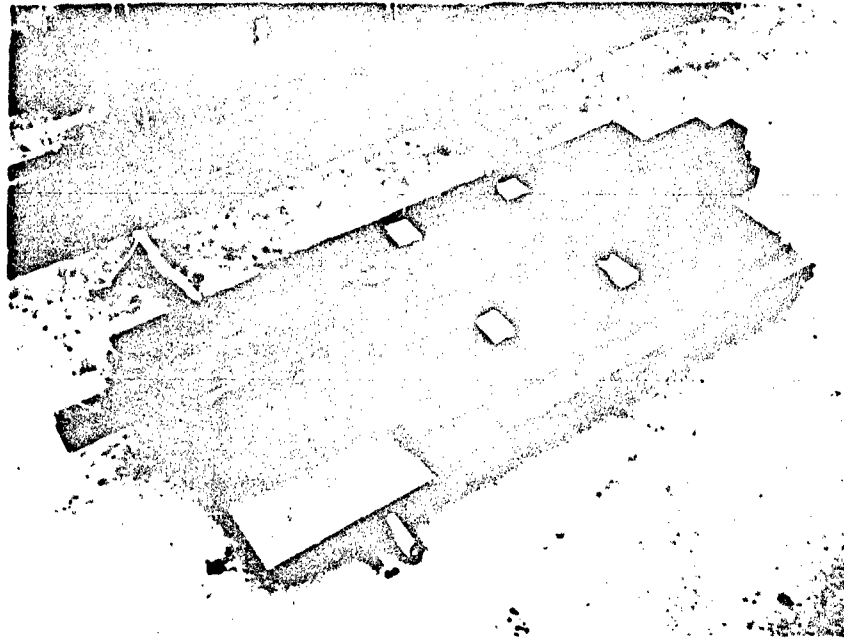


Figure 27. Snow-melter chute packaged for shipment.

#### Cost

Based on 1962 Laboratory fabrication costs, the price of one snow melter and chute is \$1,130.

#### Evaluation

When snow is melted inside a building during initial phases of occupancy of polar camps it is often accomplished in open containers such as GI cans using electric immersion heaters or other heat source.<sup>3</sup> The snow melter described in this report is a simple prefabricated unit which operates on the same principle as the GI cans with electric immersion heaters, but is a much larger tank insulated for greater efficiency and provided with a pipe connection for pumping the water to storage tanks. This snow melter may be quickly put into operation and yet is of adequate size for continued use after construction of the camp is completed. The field-fabricated snow chute provides a fast, simple way of filling the snow melter, thereby conserving manpower.

A prototype snow melter and chute were fabricated and erected. The snow chute, which is designed for field fabrication, was fabricated and erected by two men in 16 hours. The snow-melter tank requires no field assembly except connections to storage tanks and installation of heater units.

#### DRY HEAD KIT

There was a need in pioneer polar structures for a toilet which would be very simple to erect and operate and yet keep odors out of the building. The complexity of having a sewage-disposal line outside the building in locations where temperatures are extremely low necessitated the use of a dry-type toilet which could be emptied periodically. The Jamesway side-entry vestibule provides a suitable compartment in which to place a toilet and keep it protected from the weather yet removed from the building proper.

#### Criteria

A side-entry vestibule (see Part V) was selected to house the dry toilet, consequently the toilet had to fit into this space. In addition, it had to keep odors from escaping into the building and provide access for removing waste. Specific criteria developed for such a toilet, which are supplemental to the requirements of the general criteria, were:

1. Size and shape to fit into a side-entry vestibule.
2. All joints sealed to eliminate odors.
3. Access to outside of building for removal of waste.

#### Design

The dry head (Figures 28 and 29) was designed as a sealed commode fabricated from wood framing and plywood with all joints glued in addition to other fastening devices. The access door and cover were designed with 1 8- by 3 4-inch felt gaskets for a good seal. A pail with disposable plastic bags was selected for collection and disposal of waste.

#### Description

The dry head kit, in its final design, is detailed in Y&D Drawing No. 936914 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Technical Note N-482.<sup>5</sup>

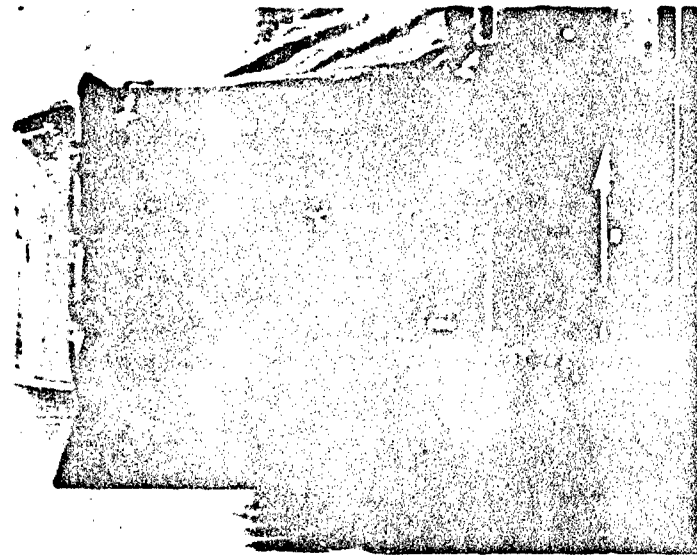


Figure 29. Access door for the dry head kit.

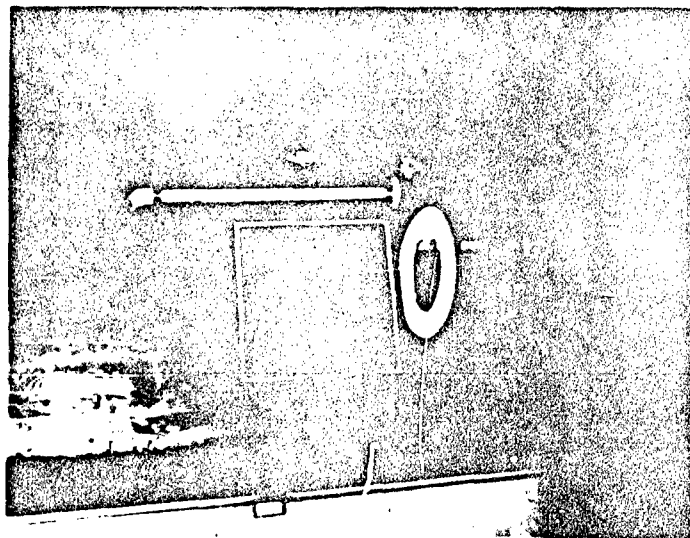


Figure 28. Dry head installed in a side-entry vestibule.

The dry head is a sealed wooden box 2 feet 6 inches wide, 1 foot 8 inches deep, and 1 foot 2-1/2 inches high fitted with a standard toilet seat nailed to the top. The waste is collected in a disposable plastic bag placed in a pail below the toilet seat. A 1-foot by 1-foot 1-1/4-inch door at the center of the back side opens to the outside of the side-entry vestibule to provide access for removal of the waste pail. The door is sealed completely around its perimeter with a 1/8- by 3/4-inch felt gasket and is kept tightly closed by a sash-type fastener. The toilet-seat opening is covered by a plywood panel with felt around the edge. The cover is hinged at the back edge of the commode and is tightly fastened with a suitcase-type catch at the front edge. A 1-1/2-inch-diameter pipe is used to vent the sealed toilet to the outside.

#### Packaging

For shipment by any type of carrier, the dry head is disassembled and packaged in a plywood box. The package, which does not include the pail and plastic bags, is 1 foot 9-1/4 inches wide by 2 feet 7-3/4 inches long by 9 inches high with a volume of 3-1/2 cubic feet. Its shipping weight is 82 pounds.

#### Cost

Based on 1962 Laboratory fabrication costs, the price of one dry head kit is \$241. This cost does not include the pail and plastic bags; these items must be included in the allowance list of expendable items when the dry head is used.

#### Evaluation

During Deep Freeze I and II heads were constructed in several camps by digging a pit and covering it with a box-type commode.<sup>3</sup> With this arrangement the head must be moved when the pit gets full. It was found that the pits in snow slowly narrowed, thereby accelerating the filling of the pit. Another problem was the discomfort caused by icy drafts blowing up through the holes. Waste disposal was sometimes accomplished by using barrels which, when filled, were hauled to an area away from the camp. Offensive odors often developed in spite of the low temperatures. The dry head kit is designed to overcome these problems by using a sealed box for collection of waste to eliminate odors and allow the head to be in a warm building, and by providing a means of periodic removal of the waste container through an access door outside the building.

A prototype dry head was fabricated and assembled. It was assembled by one man in one-half hour. No special tools or equipment were required.

## SPECIAL ROOF VENT

The standard Jamesway provides vent openings only in each endwall immediately above the door. Vents are required for diesel-fired space heaters, furnaces, ranges, and water heaters. The limitation of only two vents does not allow sufficient versatility in placement of appliances.

### Criteria

To provide vents other than at the ends of the building, the flashing had to be versatile for use any place in the roof. It had to be weathertight and yet provide insulating space between the roof blanket and vent pipe. Specific criteria developed for vent flashing through the roof of a Jamesway, which are supplemental to the requirements of the general criteria, were:

1. Application to any place in the roof of the building.
2. Minimum of 3 inches space between the roof blanket and vent pipe.

### Design

The roof-vent flashing (Figure 30) was designed of aluminum, using two rings to bind the cut edge of the roof blanket and one ring to hold the vent pipe in position at the center of the blanket opening. A flashing hood of chloroprene-coated glass cloth fastened to an aluminum ring and pulled tight against the vent pipe by a draw wire was designed for making a weathertight closure around the pipe.

### Description

The vent flashing is detailed in Y&D Drawing No. 936902 dated 2 April 1962, and the specifications for competitive procurement of this design have been published in Technical Note N-482.<sup>5</sup>

The flashing hood is a 22-inch-high by 18-inch-diameter cylinder of glass cloth coated with chloroprene on the outside. The upper edge is double-lapped and stitched. A drawstring of steel wire is provided in the upper edge to draw the hood snug against the vent pipe. The lower edge is placed between two aluminum rings, 1/8 inch thick and 20 inches in diameter, which are riveted together (Rings "A" and "B," Figures 31 and 32). The upper ring has an inside diameter of 18 inches. The lower ring has an inside diameter of 5-1/2 inches and is slit radially to 7 inches from the center every 22-1/2 degrees to provide segments which can be bent to fit the vent pipe to hold it firmly in position.



The flashing hood assembly fits over a 14-inch-diameter hole which must be cut in the roof blanket. It is bolted to an aluminum ring on the underside of the roof blanket. This ring (Ring "C," Figure 30) has an outside diameter of 20 inches and an inside diameter of 14 inches.

#### Packaging

For shipment by any type of carrier, the roof-vent flashing should be packaged with the appliance or equipment with which it will be used.

#### Cost

Based on 1962 Laboratory fabrication costs, the price of one roof-vent flashing is \$176.

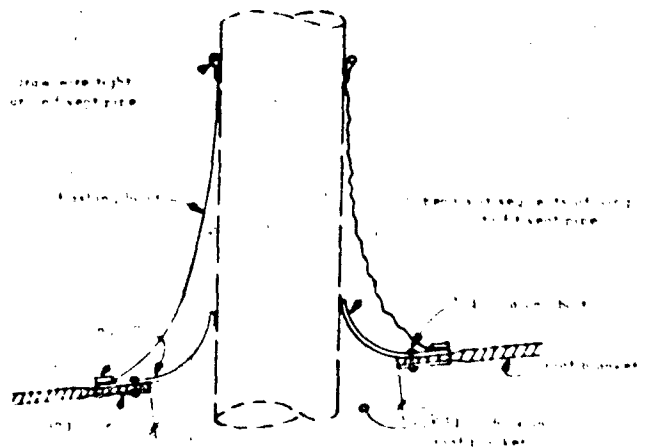


Figure 30. Section through the special roof vent.

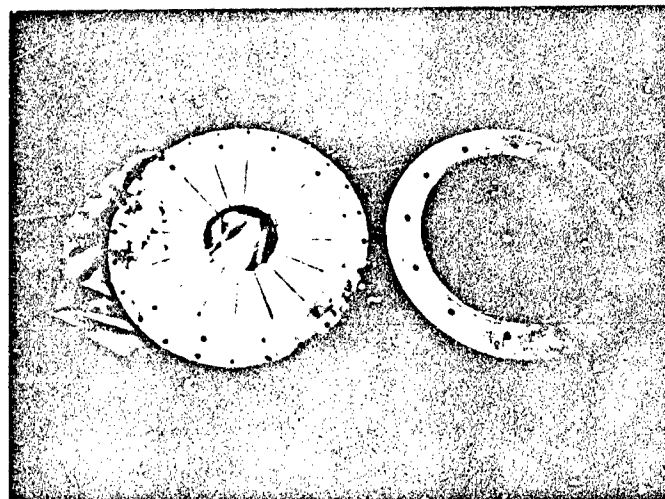


Figure 31. Bottom view of a special roof vent.

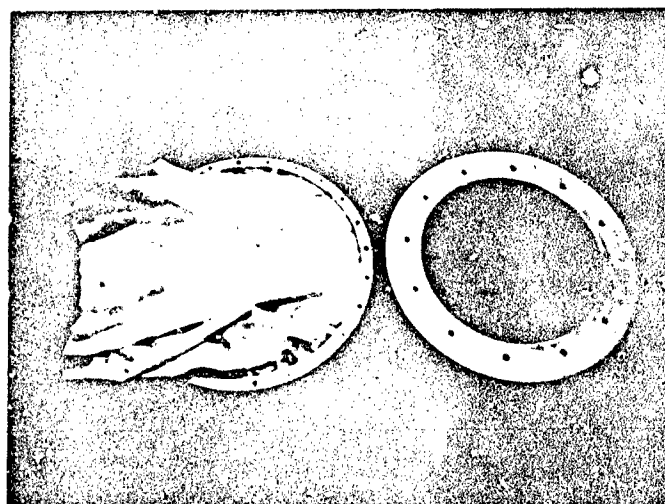


Figure 32. Top view of a special roof vent.

### Evaluation

Holes are often field-cut in the roof of Jamesways to provide outlets for vent pipes. Such a field installation was accomplished in a small camp on the Greenland icecap.<sup>1</sup> This installation and other similar ones in the past have often served the purpose; however, without flashing there is nothing to prevent leaking or to give fire protection between the blanket and the vent pipe. The roof-vent flashing provides a simple prefabricated unit which will seal a vent opening at any location in the roof and protect the blanket from the heat of the vent pipe.

A prototype roof-vent flashing was fabricated. The estimated installation time is two manhours.

### FINDINGS

1. The water-storage tank is:
  - a. Suitable for elevated use in Jamesways with wall extensions.
  - b. Nestable for multiple shipment.
  - c. Simple and easy to install with hand labor.
  - d. Easily packaged for shipment in all types of carriers including cargo aircraft.
2. The snow melter is:
  - a. A simple method for melting snow inside a Jamesway.
  - b. Suitable for fabrication in small shops.
  - c. Simple and easy to install with hand labor.
  - d. Easily packaged for shipment by any type of carrier including cargo aircraft.
3. The dry head kit is:
  - a. Suitable for fabrication in small woodworking shops.
  - b. Simple and easy to erect with hand labor.
  - c. Easily packaged for shipment by any type of carrier including cargo aircraft.

4. The special roof vent is:

- a. Suitable for use in any part of a Jamesway.
- b. Suitable for fabrication in small sheet-metal shops.
- c. Simple and easy to install with hand labor.
- d. Easily packaged for shipment by any type of carrier including cargo aircraft.

### CONCLUSIONS

- 1. Elevated water storage can be achieved in the Jamesway with the water-storage tanks and supports.
- 2. Snow can be easily supplied for melting inside a Jamesway with the snow melter and chute.
- 3. A toilet can be located inside a Jamesway by using the dry head in a side-entry vestibule.
- 4. Equipment can be vented any place in a Jamesway with the special roof vent.
- 5. The utility accessories described in this report should be considered for use with the Jamesway for special applications.

### REFERENCES

- 1. NCEL Technical Report R-006, Experimental Arctic Operation — Hard Top I, 1953, by E. H. Moser, Jr. 1 January 1954.
- 2. NCEL Technical Report R-007, Experimental Arctic Operation — Hard Top II, 1954, by W. R. Reese. 29 December 1955.
- 3. NCEL Technical Report R-155, Technical Data From Deep Freeze I, II, and III Reports (1955 to 1958), compiled by R. C. Coffin. 24 April 1961.

4. NCEL Technical Report R-210, Technical Data From Deep Freeze IV and Deep Freeze 60 Reports (1958 to 1960), compiled by R. C. Coffin. 13 December 1962.
5. NCEL Technical Note N-482, Pioneer Polar Structures — Specifications for Jamesway Shelter Accessories, compiled by G. E. Sherwood. 15 April 1963.
6. NCEL Technical Report R-189, Sea-Ice Engineering, Summary Report — Project Ice Way, by W. D. Kingery, D. W. Klick, J. E. Dykins, et al. 25 September 1962.
7. NCEL Technical Note N-422, Erection of Quarters Building for Pioneer Polar Camp, by R. W. Hansen, C. R. Hoffman, and E. H. Moser. 26 September 1961.

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